COMPARISON OF THE SIGNIFICANCE OF SOME FIXED FACTORS ON MULTI LEVEL CHILD SURVIVAL

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Abstract

A major outcome of the Millennium Development Goals is to reduce child mortality. However, efforts in dealing with this challenge do not seem to lead to desirable levels of satisfaction. In developing Countries, especially in sub Saharan Africa, availability of adequate and reliable statistics that will guide the application of scarce resources and effort can be cited as plausible reasons for this. In this study, Non Parametric methods were used in a Multi level study of Child survival to estimate the survival and hazard functions as well as test for differences in survival functions and regress some prognostic factors at the various levels of child growth. The study showed that in Ghana, 1 out of every 10 children born would not survive by year five, 60.70% of them in the first year with 32.84% of them in the first month. Approximately 29.53% of those who lose their lives in the first five years do so in the first 8 days of life. Among the factors tested, whether a child was a singleton or not was shown to most significantly affect child survival. As a child grows, some factors that influence his or her survival become more and more pronounced. The Increasing significance, and its corresponding widening relative risk, for place of residence and Mothers status as a child grows from Neonates to Childhood, highlights the effect of social inequalities on child survival. This suggests that some social interventions, particularly when targeted at the mother, could help improve Child survival.

Keywords: Censoring, hazard function, Moving Cohort, Prognostic factors, Survival function

Introduction

Improving child health has been a key concern for many nations and this is evident from observations from numerous international summits and conferences including the Millennium Summit in 2000. Child mortality, and its converse Survival, is a sensitive indicator of a country's development and telling evidence of its priorities and values. Investing in the Health of a Child and their mothers is not only a human rights imperative, it is a sound economic decision and the surest way for a country to set its course towards a better future (UNICEF, 2007). Since the adoption of the Millennium Development goals, child mortality has received a lot of attention leading to a significant decline in the incidence of this phenomenon. However, these declines have not been significant enough to achieve the set MDG4 (UN, 2009; IGME, 2010; IGME, 2011; Hagen, 2007). Most of these declines have not been in Sub-Saharan Africa where the mortality trend has either stalled or even worsened (Adetunji & Bos, 2006; McNeil, 2007; UN, 2009). With only about 11 percent of the world population, Sub-Saharan Africa accounts for about half of the victims of child mortality (Hagen, 2007). Most of these child deaths are preventable as the main causes have been identified (UNICEF, 2003; News Medical, 2006; UNICEF, 2012). Under-5 mortality could be specified as neonatal mortality (deaths within the first month after birth), Infant mortality (deaths within the first one year after birth) and child mortality (deaths within the first five years after birth) with the former being nested in the later. These three groups are usually studied separately leading many to think, and or interpret, that what is applicable at one level, is applicable for all the levels of child survival.

Addressing the problem of child mortality in Sub-Saharan Africa in particular, where there are competing interests for scarce resources, will require a prioritization of the issue of child mortality, a synchronized study of all the sub groups of child mortality and focused interventions of the scare resources at the people who need it most and at the time when it is most needed (Shoo, 2007). To achieve this, spacio-temporal indicators which can provide knowledge of risk factors and quantification of relative risks are essential as well as a concurrent study of each level of Child Survival. The spatial measures like child mortality rate etc, which are widely used, are not informative enough, are influenced by population composition and have inherent problems in their implementation.

In this study, we set out to investigate the following questions:

- What are the Neonatal, infant and child survival rates in Ghana?
- At what periods are we losing most of our children?
- When are the risks of mortality highest (and lowest) and survival worse (and best)?
- What are some of the possible risk factors and how do they affect survival?

- Are the effects of the factors that influence survival the same throughout the child's Life?

Responses to these questions should guide actions towards reduction of child mortality. To attempt to answer these questions, Non Parametric methods were used in a Multi level study of Child survival to estimate the survival and hazard functions as well as test for differences in survival functions for the various stages of growth, leading to the identification and regression of associated prognostic factors. By applying survival analysis techniques, we develop spacio-temporal estimates for the three levels of child survival and identify some risk factors and how they affect survival at each of these levels. We compare the statistics and significance, of each of these factors, at each of these levels of child survival, to see how their effect on child survival changes from one level to the other.

Methodology

Data Set

The data for this study was obtained from the Ghana statistical Service and was collected in the Ghana Maternal health survey 2007. The Survey was jointly implemented by the Ghana Statistical Service and the Ghana Health Service with technical assistance from the Macro International, a U.S.A based company. Survival analysis typically follows a group of people from beginning to the end of a study to observe when each member of the group will fail: This cohort is known as a stationary cohort. However, in this study, the moving or cross sectional cohort, which uses observations over a single cross section of time, is used and manipulated to represent a cohort. By this technique, different individuals may have different start points within the selected study time frame however the estimates derived provide estimates of current trends in survival: the time frame used in this study is 2002 to 2007.

In other to estimate survivorship, the variable needed is the time to death, for the dead, and the period of observation, for those alive. These data are however classified as censored (for those not dead) and uncensored (for those dead). For the Child, infant and Neonatal survivals, these variables are defined as the age of a child at death for uncensored data and the age of a child at the date the data was collected for censored data. It is measured in years for a child, months for an infant and days for a neonate; all censored data are right censored. In all, a total sample of 6658 children was used in this study.

Methods

To estimate the survival function $S(t)$, we assumed that child survival are a probabilistic or stochastic process i.e. the times at which the deaths of children occur are a realization of some random process. The time to death for any Child, T, is therefore a random variable having a probability distribution $f(t)$ and consequently a cumulative distribution function $F(t)$ and from which the hazard function $h(t)$, can be found

Basic Concepts in Survival

Let T, denote the survival time from birth. The distribution of T can be characterized by three equivalent functions (Lee & Wang, 2003).

Survival Function [S(t)]

$$S(t) = P(a\ Child\ survives\ longer\ than\ t)$$
$$= P(T > t)$$

From the definition of the cumulative density function $F(t)$ of T,

$$S(t) = 1 - P(a\ \ Child\ dies\ before\ t)$$
$$= 1 - F(t)$$

$S(t)$ is a non increasing function of time with properties

$$S(t) = \begin{cases} 1 & for\ t = 0 \\ 0 & for\ t = \infty \end{cases}$$

Probability Density function [f(t)]

The survival time has a probability density function defined as the limit of the probability that a Child dies in the short interval t to Δt per unit width Δt, or simply the probability of dying in a small interval per unit time. It can be expressed as:

$$f(t) = \frac{\lim_{\Delta t \to 0} \text{P[a Child dying in the interval (t ,t+}\Delta\text{t)]}}{\Delta t}$$
$$= \frac{\lim_{\Delta t \to 0} P[x \in (t, t+\Delta t)]}{\Delta t}$$

Where x is a Child dying

$f(t)$ is a non negative function such that;

$$f(t) = \begin{cases} \geq 0 & for\ all\ t \geq 0 \\ = 0 & for\ all\ t < 0 \end{cases}$$

Hazard function [h(t)]

The hazard function, $h(t)$, gives the conditional failure rate. It is the probability of a Child dying in a small interval of time assuming that the Child has survived to the beginning of that time interval.

$$h(t) = \frac{lim_{\Delta t \to 0} P\begin{bmatrix} a\ Child\ dying\ in\ the\ interval\ (t, t+\Delta t) \\ given\ the\ Child\ has\ survived\ to\ t \end{bmatrix}}{\Delta t}$$
$$= \frac{\lim_{\Delta t \to 0} P[x_t \in (t, t+\Delta t)]}{\Delta t}$$

Where x_t is a Child dying after he/she has survived to time t

The hazard is also known as the instantaneous failure rate, the force of mortality, the conditional mortality rate or the age specific death rate. All these three functions can be depicted graphically and are related by

$$h(t) = \frac{f(t)}{S(t)}$$

Estimating the Survival Functions

In this study we use a non parametric method, the Life table method, to estimate the survival functions. The Life table method, which estimates the survival functions for each interval, uses their mid points to estimate the hazard and density functions and the upper limit to estimate survival functions as follows (Gehan, 1969); For the i^{th} interval, let t_i be the start time and q_i be the conditional probability of dying. Then;

$$\hat{S}(t_i) = \prod_{j=1}^{i-1}(1-\hat{q}_j)$$

$$\hat{h}(t_{mi}) = \frac{d_i}{b_i(n_i - \frac{1}{2}d_i)} = \frac{2\hat{q}_i}{b_i(1-\hat{p}_i)}$$

Where

t_{mi} is the mid-point of the i^{th} interval,

d_i is the number of children dying in the i^{th} interval,

n_i is the number of children exposed in the i^{th} interval,

$q_i = \frac{d_i}{n_i}$ is the conditional probability of dying in the i^{th} interval,

$p_i = (1 - q_i)$ is the conditional probability of dying in the i^{th} interval,

b_i is the width of the i^{th} interval.

Log rank Test

The Log-rank test (Peto & Peto, 1972), a non parametric test of difference for survival functions, was used to test for differences in survival function for a given factor. For a k factor group, this test the hypothesis that;

$$H_o: S_1(t) = S_2(t) = \cdots = S_k(t) \quad \text{for all } t$$

Against the alternative;

$$H_1: \quad not\ all\ S_j(t)\ are\ equal. \qquad j = 1, 2, ..k.$$

where $S_j(t)$ is the survival function for the j^{th} group

This is tested as a chi-square test which compares the observed numbers of failures to the expected number of failure under the hypothesis.

Thus, given that O_j and E_j is the observed and expected number of deaths respectively for the j^{th} group, the test statistic is given by;

$$\chi^2 = \sum_{j=1}^{k} \frac{(O_j - E_j)^2}{E_j}$$

where

$$E_j = \sum_{all\ t} e_{jt}$$

$$e_{jt} = \frac{n_{jt}}{\sum_{all\ j} n_{jt}} \times d_t$$

and

n_{jt} is the number of children still exposed to the risk of dying at time up to t for the j^{th} group

d_t is the total number of deaths for all groups at time t. Thus

$$d_t = \sum_{all\ j} d_{jt}$$

has approximately the chi-square distribution with $k-1$ degrees of freedom. A large chi-square value will lead to a rejection of the null hypothesis in favor of the alternative that the k groups do not have the same survival distribution.

Proportional Hazard Regression

The Cox proportional regression as proposed by Cox (Cox, 1972) is used to determine the effect of some socio economic and demographic factors on Neonatal, Infant and Child survival. In this model, the hazard for an individual is assumed to be related to the covariates through the equation;

$$h_i(t) = \lambda_0(t)\exp\{\beta_1 x_{i1} + \cdots + \beta_k x_{ik}\}$$

Taking the logarithm of both sides, the model can also be written as

$$\log h_i(t) = \alpha(t) + \beta_1 x_{i1} + \cdots + \beta_k x_{ik}$$

where $\alpha(t) = \log \lambda_0(t)$.

If we further specify $\alpha(t) = \alpha$, we get the exponential model, if $\alpha(t) = \alpha t$, we get the Gompertz model. If $\alpha(t) = \alpha \log t$, we have the Weibull model etc. The specification of $\alpha(t)$ is however unnecessary in a Cox model and it can take any form.

The ratio of the hazard for two individuals i and j (say rural children and urban children) is then given by;

$$\frac{h_i(t)}{h_j(t)} = \frac{\lambda_0(t)\exp\{\beta_1 x_{i1} + \cdots + \beta_k x_{ik}\}}{\lambda_0(t)\exp\{\beta_1 x_{j1} + \cdots + \beta_k x_{jk}\}}$$

$$= \exp\{\beta_1\left(x_{i1} - x_{j1}\right) + \cdots + \beta_k(x_{ik} - x_{jk})$$

$\beta_1, \ldots, \beta_k$ therefore measures the relative risk for the i^{th} child, over the j^{th} with respect to the change in the x_l^{th} covariate, $l = 1, \ldots, k$ respectively.

Results

Table 1 provides information on the Life Table estimates for Neonatal, Infant and Child Survival. The estimates show that for Child survival, approximately 90% (probability of 0.898233) of children born survive to age 5 years, thus a 9 in 10 chance of reaching 5 years. About 94% (Probability of 0.941713) and 97% (Probability of 0.9667820) of children born, reach one year and one month respectively, as shown by the infant and child survival.

Table 1. Table of Hazard and Survival estimates for Neonatal, Infant and Child Survival

Time	Hazard h(t)	S.E. of Hazard	Time	Survival S(t)	S.E. of Survival
		(a) Neonatal Survival			
1	0.0089421	0.0008232	2	0.9822740	0.0016173
3	0.0030689	0.0004852	4	0.9762640	0.0018658
5	0.0016964	0.0003617	6	0.9729570	0.0019882
7	0.0015476	0.0003461	8	0.9699500	0.0020927
9	0.0001551	0.0001097	10	0.9696490	0.0021028
11	0.0003105	0.0001553	12	0.9690470	0.0021229
13	0.0000777	0.0000777	14	0.9688970	0.0021279
15	0.0006229	0.0002202	16	0.9676910	0.0021676
17	0.0000000	*	18	0.9676910	0.0021676
19	0.0000000	*	20	0.9676910	0.0021676
21	0.0003128	0.0001564	22	0.9670850	0.0021873
23	0.0000000	*	24	0.9670850	0.0021873
25	0.0000000	*	26	0.9670850	0.0021873
27	0.0000785	0.0000785	28	0.9669340	0.0021922
29	0.0000786	0.0000786	30	0.9667820	0.0021971
		(b) Infant Survival			
0.5	0.0339686	0.0022846	1	0.966599	0.0022090
1.5	0.0023885	0.0006167	2	0.964293	0.0022825
2.5	0.0026118	0.0006530	3	0.961777	0.0023616
3.5	0.0045245	0.0008707	4	0.957436	0.0024944
4.5	0.0020596	0.0005945	5	0.955466	0.0025533
5.5	0.0015820	0.0005273	6	0.953955	0.0025984
6.5	0.0025253	0.0006749	7	0.951549	0.0026702
7.5	0.0024076	0.0006678	8	0.949261	0.0027382
8.5	0.0022773	0.0006574	9	0.947102	0.0028020
9.5	0.0029101	0.0007514	10	0.944350	0.0028825
10.5	0.0017841	0.0005947	11	0.942667	0.0029315
11.5	0.0010118	0.0004525	12	0.941713	0.0029594
		(c) Child Survival			
0.5	0.0637395	0.0033210	1	0.9382290	0.0031190
1.5	0.0154008	0.0018956	2	0.9238900	0.0035356
2.5	0.0155321	0.0022655	3	0.9096510	0.0040455
3.5	0.0094340	0.0022880	4	0.9011090	0.0045068
4.5	0.0031974	0.0022609	5	0.8982330	0.0049301

This makes the first year of life the most risky year, accounting for over 60% (60.70%) of the total child deaths. The first month is the riskiest month where over 3% (Probability of 0.0334165) of children born die representing about a third (32.84%) of the total deaths by age 5 years. Within the first month of life, the most risky period, by far, is the first day of life (Hazard of 0.0089421) where about 1 % of children born are lost. By the second day, approximately 1.8% (Probability of 0.0177257) of children die; i.e. about 17% of all deaths by age 5 years (17.42%). By the eighth day, approximately 3% (Probability of 0.0300497) of children born in Ghana die. This represents about 90% (90.46%) of the total deaths in the first month, and about 30% (29.53%) of all deaths by age five years. The hazard rates for neonatal, infant and Child survival all show a trend that generally decreases at a decreasing rate.

The log rank test, shown in Table 2, shows that the regions in Ghana that received the intervention on reducing maternal morbidity and mortality program in 2006 (R3M Regions), type of town (large City, small City, Town and Rural) and whether the child was a singleton or not, are significant ($P \leq 0.05$) prognostic factors of child survival at all levels. Whether a mother had ever been to school, her place of residence (Rural or Urban) and Region, are significant prognostic factors ($P \leq 0.05$) only after one month of life. Whether a mother has ever been to school is significantly associated ($P \leq 0.05$) with child survival after the first month of life; however, her level of education is not significant at any level ($p > 0.05$). After the first year of life, a Mother's age and Religion are significantly associated ($P \leq 0.05$) with child survival.

Table 3 shows the proportional hazard analysis for Neonatal, Infant and Child survival. In conformity with the log rank test, whether a child is a singleton or not is extremely significant ($P=0.000$) at all levels of child survival. The risk of a singleton dying is significantly lower than that of a non-singleton ($RR<1$ at all levels of child survival). Non-singletons have approximately 4.1($RR=0.2419$), 3.4($RR=0.2926$) and 2.5($RR=0.4023$) times higher risk than singletons at the neonatal, Infant and child survival stages respectively. The effect of mothers education on child survival is again shown to be significant ($P<0.05$) in the Post Natal period. Children whose mothers have ever been to school have a lower risk ($RR<1$) of dying than those whose mothers have never been to school. Mother's age and region of residence (whether a resident of an R3M region or not), are significant determinants of child survival after the first year of life ($P<0.05$): After the first year, a child's survival increases by about 1.5% ($RR=0.9857$) for every additional year a woman waits to be a mother. Children of the R3M Regions have an about 14% lower risk ($RR=0.8629$) of dying than those from other regions. Additionally, while Male children, firstborns and children from rural areas generally have a lower survival ($RR>1$), this is not statistically significant ($P>0.05$). Also, a child whose mother is a Christian has better survival ($RR<1$) than those of other religions (Moslem, Traditionalist/Spiritualist and others) but this is also not statistically significant ($P>0.05$).

Table 2. Log rank Test of Prognostic factors for Neonatal, Infant and Child Survival

		Chi-Square			P-Value		
Variable	D.F	Neonatal	Infant	Child	Neonatal	Infant	Child
Socio Economic:							
Region	9	15.95970	22.86940	22.27310	0.068	0.006*	0.008*
R3M Region	1	3.88437	6.27273	8.36333	0.049*	0.012*	0.004*
Rural or Urban	1	1.22580	4.40213	7.69284	0.268	0.036*	0.006*
Type of Town	3	8.28110	11.87370	12.51620	0.041*	0.008*	0.006*
Mother Ever Schooled	1	0.58074	4.01205	7.54756	0.446	0.045*	0.006*
Mother's HLEA**	3	2.85656	0.31678	1.41820	0.414	0.957	0.701
Mother's Religion	3	1.32712	5.59925	9.55382	0.723	0.133	0.023*
Demographic:							
Mother's Firstborn	1	1.55047	0.74988	0.41857	0.213	0.387	0.518
Singleton or Not	1	61.26630	68.44030	39.55300	0.000*	0.000*	0.000*
Child's Gender	1	3.78695	2.80617	3.02506	0.052	0.940	0.082
Mother's Age (Categorized)	2	5.14199	4.81124	8.11144	0.076	0.090	0.017*

* Means significant at the 5% level of significance
** Mother's HLEA represents Mother's Highest level of education Achieved

Table 3. Cox's Regression of Neonatal, Infant and Child Survival

		P-Value			Exp (B)=Relative Risk		
Variable	level	Neonatal	Infant	Child	Neonatal	Infant	Child
Socio Economic:							
Rural or Urban	Urban	0.671	0.300	0.105	0.9366	0.8832	0.8440
Ever Schooled	Yes	0.450	0.050*	0.008*	0.9851	0.9153	0.8937
R3M Region	R3M	0.070	0.052	0.036*	0.7766	0.8349	0.8629
Religion		0.912	0.598	0.406	-	-	-
	Moslem				1.0170	1.1030	1.2170
	Others				1.0490	1.2200	1.1350
	Trad/Spi**				1.1540	1.2570	1.2330
Demographic:							
Mothers Age		0.855	0.407	0.044*	0.9986	0.9938	0.9857
First born	Yes	0.182	0.260	0.320	1.3840	1.2080	1.0540
Child's Gender	Male	0.055	0.103	0.100	1.2930	1.1800	1.1540
Singleton or Not	Singleton	0.000*	0.000*	0.000*	0.2419	0.2926	0.4023

* Means significant at the 5% level of significance
** Trad/Spi represents Mothers who are African Traditionalist or Spiritualist

Discussion

Firstly, the hazard rates for neonatal, infant and Child survival all show a trend that generally decreases at a decreasing rate indicating that the onset of life is the riskiest and that this risk, decreases with time. This and the estimates of survival are consistent with many research findings (Shoo, 2007; IGME, 2011; Countdown, 2012). Thus by paying more attention to the early days of life, neonatal, infant and child survival can be significantly reduced. From the cumulative failure and survival estimates, we estimate that by paying close attention to the early days of life like the first 2 days, first 8 days and first 30 days, Child mortality could be reduced by as much as 17%, 30% and 33% respectively. Thus for Ghana, as in other African countries (Shoo, 2007), where some women do not get access to adequate health care during pregnancy, child birth and thereafter, and where antenatal care generally starts at about one month after birth, the practice of readily discharging mothers with their children from health facilities without basic medical tests on the child, could only worsen neonatal, infant and child survival.

Secondly, the log rank test conducted at the various stages of a child's life does not only show the risk factors but also, the direction of the changing level of significance for the factors when tested at the various stages, shows that as a child grows from a neonate through infancy to childhood, R3M, Urban or Rural, Type of Town, Mother Ever Schooled and Mother's Religion become more and more significant in determining a child's survival while, whether a child is a first born or not becomes less and less significant. Mother's age, Gender of Child, Mother's highest level of education achieved, and whether a child is a singleton of not, become less significant, from neonates to infancy, but more significant, from infancy to childhood, in determining a child's survival. Thus, where a child comes from (Region, R3M Region, Rural urban, type of town), and the mother's socio economic characteristics (a Mother's Religion and whether she has ever been to school) become more of a determining factor of the child's survival. Also, a Mother's Age and highest level of education attained, and the characteristics of the child (Gender and Singleton or not) become more of a determining factor of a child's survival only after infancy. These trends, suggests the increasing impact of the social divide of child survival and the effects of the changing demands and responsibilities of raising a child after the first year of life.

Four factors (Ever schooled, Mothers age, R3M Region and whether the child is single or multiple birthed) are shown to be significant determinants of child hazard and hence survival at various stages of the child's growth in the Cox regression. The need for all women to have basic education, as a means of reducing child mortality, is supported in this study by the fact that, whether a mother has ever been to school or not is a significant determinant of child survival after the first month of life: Children whose mothers have ever been to school, are shown to have lower risk (RR<1) and hence better survival. Luthra, (2007) argues that Literate women tend to marry later and are more likely to use family planning methods. Mothers with primary education tend to take better care of their children and are more likely to seek medical care, such as immunization, than those who lack schooling. All of these will have the end result of improving Child survival. The hazard for non singletons, on the survival of a child is highlighted in this study. Single birthed children are shown to have very significantly (P=0.000) lower risk (RR<1) than multiple birthed children right from birth (RR=0.2419 at neonatal, RR=0.2926 at infant and 0.4023 at child). This relative hazard is much lower than what pertains in Bangladesh (Hong, 2006) but draws attention to the challenges associated with successfully raising multiple birth children. The dangers of early motherhood are shown in this study as after the first year of a child's life, the older the Mother, the better the survival of the Child (RR<1): A child's risk of dying, decreases by about 1.5% (RR=0.9857) for every additional year a woman waits to be a mother. This is probably because of the telling effect of the demands of raising a healthy child, on a young mother. With 15% of adolescents having begun childbearing, and most women becoming mothers by age 20 years (GSS; GHS; Macro Interntional, 2009), the average age of motherhood could be comfortably delayed: A delay of say 5 years could reduce the risk of losing a child by about 7.5%. Nanda & Ram (2003) assert that, the very environment for child birth is not conducive and safe in the teenage because, both medically and socially, it provides the highest possibility of risky consequences to mother as well as to child. At these ages, mothers are much more susceptible to several social customs and beliefs that hamper the utilization of many of the available services. Culturally, a young mother who is not schooled could face a continuum of challenges in raising a child especially after the first month when the extra help normally received from society would have began to wane. Children from the R3M regions are shown to have better survival than those of other regions after the first year of life (RR<1). This could probably be because of the maternal morbidity and mortality intervention that took place in these regions. The intervention, which sought to reduce maternal morbidity and mortality by making contraceptives and comprehensive abortion care more available and highly utilized, would have the effect of Planned Parenthood and healthy motherhood. The net result is that, mothers would have children when they are ready for them and will be alive and healthy to take care of them and this could lead to better child survival.

The Cox regression analysis shows that the effect of the factors studied on child hazard, and hence survival, does not remain the same over the years. While the effect of most of the factors studied become more significant, some become less significant with age. The change in significance level and its corresponding relative risk from one level to another show that, while the effect of Gender and first borns wane with age (P-value Increasing and estimate of relative risk approaching 1), all other factors considered show an increasing effect (significance) on child survival from a lower level to a high one. The Increasing significance, and its corresponding widening relative risk, for place of residence (region and town) and Mothers status (age, ever schooled, religion) as a child grows from Neonates to Childhood, highlights the effect of social inequalities on child survival. As a child grows, while the effect of biological factors wane, demographic and socio economic factors become more and more significant in determining child survival. As a child grows, the characteristics of the mother and the socio cultural dynamics of society, become increasingly important in determining child survival. The direction of the effect of the socio economic and demographic factors studied in this paper suggests that, cultural practices and norms play a substantial role in child Survival and that some social interventions, particularly when targeted at the mother, could help improve Child survival.

Conclusion

This study used a nationally representative sample of both censored and uncensored data and the application of survival analysis techniques in the study of child survival. The use of survival analysis provides spacio-temporal estimates with measurable precision and a better measure of the risk a child goes through till he/she reaches age 5 years as compared to the spacial central rates widely used. Also, survival estimates allow for direct comparison of different groupings since estimates of survival functions are not influenced by population composition. By using non parametric techniques, we estimated survival functions and tested for differentials using the log rank test. The proportional hazard technique was used to investigate some of these differentials and determinants of neonatal, Infant and Child survival according to some demographic and socio economic factors. The Nested study of the various levels of child survival (Neonatal, Infant and Child) from the same data set helps in understanding the changes across these levels. These techniques and methods have provided standard platforms for comparison of the various levels of child survival and provided insight into the varying effect of these differentials and determinants of child survival, at the various stages of a child’s life.

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